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BUILDING UP A RUN-DOWN COTTON PLANTATION.

BY

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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., March 17, 1908.

SIR: I have the honor to transmit herewith a paper entitled "Building Up a Run-Down Cotton Plantation," by Mr. D. A. Brodie, Assistant Agriculturist, Farm Management Investigations. This paper is an account of three years' operations on the farm of Mr. Jo. M. Walker, of Latour, Ark., in changing a worn-out cotton plantation into a profitable stock and hay farm. I recommend that it be published as a Farmers' Bulletin.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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BUILDING UP A RUN-DOWN COTTON PLANTATION.

INTRODUCTION.

This bulletin is an account of the progress made in three years in changing a run-down cotton plantation into a profitable stock and hay farm. The results obtained from the use of cowpeas and other leguminous crops in restoring the fertility of the land have exceeded the expectations of those in charge of the work. Not only have the crops yielded greater returns each year, but all the grain and hay necessary to feed 14 brood mares, 1 jack, 2 driving horses, 1 saddle horse, a varying number of mule colts, a cow and calf, and from 50 to 75 hogs has been raised and a considerable surplus of grain and hay sold each year.

However, it is only fair to state that all of the credit for this increased production is not due to the legumes alone, because at the start an entirely new system of farming was put into operation; modern implements took the place of the old ones, the land was plowed deeper, better drainage established, improved seed introduced, and better methods of cultivation practiced, each doubtless contributing something to the general improvement.

GENERAL CONDITIONS IN 1905, 1906, AND 1907.

The farm referred to in this bulletin consists of about 375 acres of slightly rolling land at the foot of Crowleys Ridge, in Phillips County, Ark. The soil is a reddish silt loam, with occasional patches of sandy loam. The lower levels of the farm are very poorly drained, and in consequence the crops on these portions have suffered greatly during seasons of excessive rainfall.

For upward of fifty years the crops have been for the most part cotton and corn, grown under the tenant system common in the South.

As a result of this practice for so long a period the land was reduced to a very unproductive state. Table I gives a very good idea of the condition of the land at the time when the owner, Mr. Jo. M. Walker, not satisfied with the poor returns from the farm, took direct charge of it.

TABLE I.—*Crops, acreage, and yields of farm for 1905.*

Crop.	Area in acres.	Yield to the acre.	Total yield.
Cotton	140	¼ bale	35 bales.
Corn	80	15 bushels	1,200 bushels.
Oats	20	20 bushels, estimated	400 bushels.
Cowpeas	80	1½ tons of hay, 8 bushels of grain.	120 tons of hay, 640 bushels of grain.

The general average yield of cotton for the United States for 1905 was 0.4 of a bale per acre and of corn for the same year 28.8 bushels, almost double in each case the yields given in this table.

On the other hand, note the satisfactory yield of hay and grain from the cowpeas and the influence they had on the land, which is shown in the increased yields in 1906, given in Table II.

TABLE II.—*Crops, acreage, and yields of farm for 1906.*

Crop.	Area in acres.	Yield to the acre.	Total yield.
Cotton	6	½ bale	3 bales.
Corn	50	37.5 bushels	1,875 bushels.
Oats	15	30 bushels, estimated	450 bushels.
Cowpeas	120	0.966 ton of hay, 9.5 bushels of grain.	116 tons of hay, 1,140 bushels of grain.
Red clover	2	3 tons of hay	6 tons of hay.

In this case the yield of cotton was doubled after one crop of cowpeas and the yield of corn increased 2½ times that of the previous year.

Table III shows continued improvement from the use of leguminous crops on this land.

TABLE III.—*Crops, acreage, and yields of farm for 1907.*

Crop.	Area in acres.	Yield to the acre.	Total yield.
Cotton	12	0.708 bale	8.5 bales.
Corn	50	34 bushels	1,700 bushels.
Oats	20	30 bushels, estimated	600 bushels.
Cowpeas	60		

Here the general average for the season is nearly three-fourths of a bale of cotton per acre, almost three times the yield for 1905, while the yield of corn is more than double that for 1905.

In order to better understand the figures given in Tables I, II, and III, the various operations during the three years will be discussed in detail.

COMPARISON OF THE OPERATIONS WITH COTTON FOR 1905, 1906, AND 1907.

Previous to 1905 this plantation had the local reputation of being both poor and unprofitable. In 1905, as the records show, the yield of cotton was one-fourth of a bale to the acre. The crop was raised by negro tenants who broke the ground in the usual way with "pony" plows and bedded and cultivated it with single mule teams.

In 1906 six acres were planted in cotton, following a crop of cowpeas. This cotton was raised entirely with hired help. The land was plowed deep with a 2-horse walking plow and afterwards bedded

and planted in the usual way, chopped twice, and cultivated shallow four times with a surface cultivator (fig. 1). The yield was one-half bale to the acre.

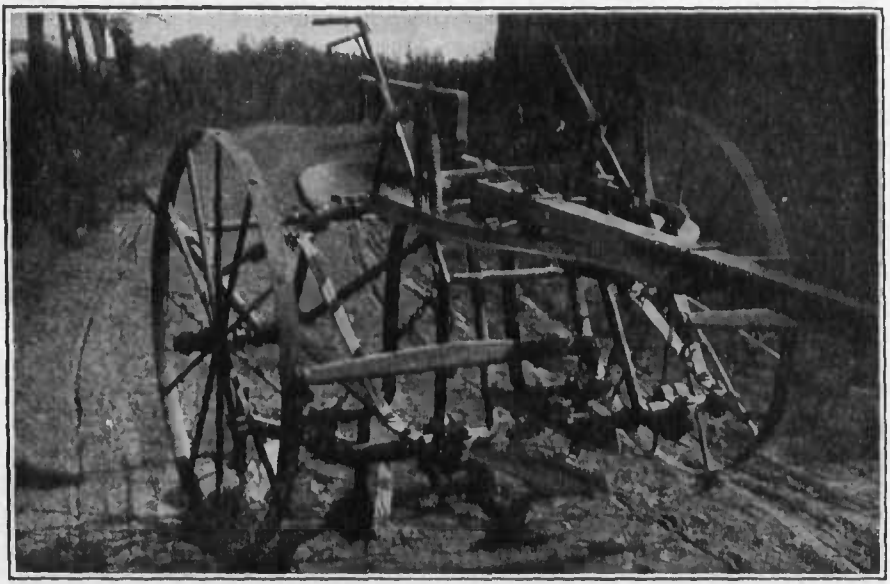

FIG. 1.—Cultivator used in cultivating cotton and corn by the check-row system. Note the wide, sharclike shovels, especially adapted for shallow cultivation.

The land for the 1907 cotton crop was broken with the plow set to run 10 inches deep, double disked (fig. 2), and harrowed with a section harrow (fig. 3). This implement is also known as a smoothing harrow or spike-toothed harrow.

A few days later the land was again double disked and harrowed as before. It was then laid off with a check-row marker, with the hills 3 feet 4 inches apart each way. The seed, a long-staple variety, Floradora, was dropped by hand and covered with a section harrow. Later the cotton was thinned to one stalk to the hill and cultivated five times with a sulky cultivator. The cultivating was done both ways and there was no hoeing.

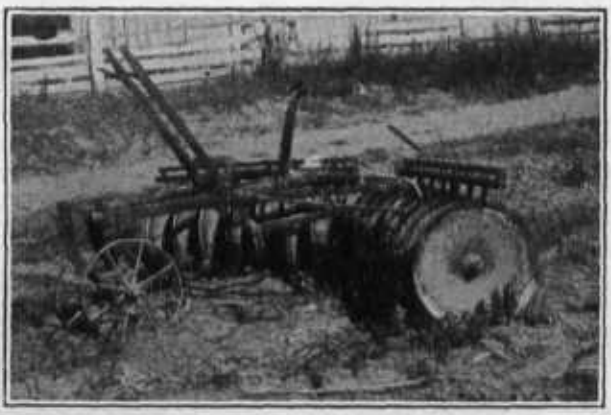

FIG. 2.—Tongueless disk harrow used effectively in preparing land after deep plowing.

As will be seen from Table IV, this crop is considered in three parts:

(1) Four acres, planted after one crop of cowpeas; (2) six acres, planted after one crop of cowpeas, with 300 pounds of 8—2—2 commercial fertilizer to the acre; (3) two acres, on land that had been in

FIG. 3.—Section harrow attached behind roller to save labor.

cowpeas and clover continuously for two years and during that time two light crops of clover had been turned under. For details, see the paragraphs on red clover later in this bulletin.

TABLE IV.—*A comparison of the operations and yields of cotton for 1905, 1906, and 1907.*

Year.	Area in acres.	Previous crops.	Preparation of land.			
			Fertilizer.	Plowing.		After-cultivation.
				Date.	Depth in inches	
1905	140	Cotton and corn	None	March and April.	Shallow	Bedded.
1906	6	Cowpeas, 1 year	do	January	10	Do.
	4	do	do	do	10	Double disked twice; harrowed twice.
1907	6	do	300 pounds	do	9	Do.
	2	Cowpeas and clover, 2 years.	None	April	10	Do.

Year.	Planting—	Cultivation—	Yield to the acre.
1905	With cotton planter	With mule and pony plow	¼ bale.
1906	do	Chopped twice and cultivated four times with surface cultivator.	½ bale.
1907	By hand in check rows, 1 bushel to 5 acres, May 13.	Thinned to one stalk and cultivated five times with surface cultivator.	Do.
	do	do	¾ bale.
	do	do	1 bale.

The 4-acre field yielded one-half bale to the acre; the 6 acres, three-fourths of a bale; and the 2 acres, 1 bale per acre, an average for the whole crop of nearly three-fourths of a bale per acre (see Table III). This is a striking example of the beneficial effect of leguminous crops in building up exhausted soils. Especially is this true when we realize that the yield of cotton in 1904 on this land was only one-fourth of a bale to the acre.

Mr. Walker has kindly furnished an itemized statement of the operations on the 2-acre plot, which is presented here.

Statement of operations on 2-acre plot.

EXPENSES.

Breaking, at $1 an acre	$2.00
Disking (double disking twice)	1.50
Harrowing three times	1.50
Marking both ways	.75
Seed, 12 pounds,[a] at 10 cents	1.20
Cultivating five times and thinning	6.00
Picking 3,400 pounds of seed cotton, at 60 cents	20.40
Ginning 1,003 pounds of lint, at 80 cents	8.02
Land rent, at $3 an acre	6.00
	47.37

RECEIPTS.

Two bales lint, 1,003 pounds, at 14½ cents	145.43
2,200 pounds of seed, at $3 per hundred	66.00
	211.43
Less expenses	47.37
Net profit	164.06
Profit to the acre	82.03

Commenting on this statement, Mr. Walker says:

I have figured this cotton seed as worth $66 per ton and have sold most of it at that price. I paid for the seed I planted at the rate of $80 per ton and think it is a cotton particularly adapted to upland raising. It produced on this plot a 1⅜-inch staple and is a 5-locked cotton easy to pick.

The figures given herewith are correct, and under our method of cultivation the expense would have been lessened considerably per acre if the planting had been made in a large field. There is a fence surrounding this plot and the ground contains several trees. Time was therefore wasted in turning.

I am convinced that more cotton can be produced by checking one stalk 3 feet 4 inches each way and giving thorough shallow cultivation than by planting in drills, and the saving in seed will pay for the cost of planting by hand.

The cost of cultivating can be lessened one-half. The time required to get over the crop with a 2-horse cultivator is so greatly lessened that the danger of being "caught in the grass" by a period of wet weather is reduced to the minimum.

[a] If seed is good, 5 pounds of seed per acre is sufficient; the remainder was used in replanting.

COMPARISON OF THE OPERATIONS WITH CORN FOR 1905, 1906, AND 1907.

The beneficial effect of legumes on this land, as shown in the increased yields of cotton, is almost duplicated in the case of corn crops for the same three years.

In 1905, 80 acres that had previously been cropped almost exclusively to cotton and corn were plowed deep in February and planted with the check-row planter on May 15. Cultivation was given June 15 and repeated every ten days—four cultivations in all. The yield was 15 bushels per acre.

In 1906, 50 acres on which a crop of cowpeas was grown the year before were plowed deep in January with a gang plow (see fig. 4),

FIG. 4.—Gang plow, with which one man can plow five acres a day.

double disked, and harrowed with a section harrow. About April 15 the corn was planted with a check-row planter, two grains in a hill. Two varieties of seed from Illinois were used, 25 acres being planted to Ninety-Day Dent and 25 acres to Boone County White. The ground was harrowed immediately after planting and again when the corn was 3 inches high. In ten days it was cultivated with the surface cultivator, again in two weeks, and a third time four weeks later. The yield was 35 bushels to the acre for the Ninety-Day Dent and 40 for the Boone County White, an average of 37½ bushels for the season's crop. (See Tables II, III, IV, and V.)

TABLE V.—*A comparison of the operations and yields of corn for 1905, 1906, and 1907.*

Year.	Area in acres.	Previous crops.	Preparation of land.			Seeding.		
			Plowing.		After-cultivation.	Date.	Rate.	Method.
			Date.	Depth in inches.				
1905	80	Cotton and corn.	February.	10	.....	May 15	1 bushel to 7 acres.	Check row.
1906	50	Cowpeas....	January..	10	Disked and harrowed.	Apr. 15	2 grains per hill.	Do.
1907	15	.....do.....	January and February.	10	Disked twice; harrowed twice.	Mar. 23	.....do....	Do.
	2	.....do.....	.....do....	10	.....do.....	May 15	.....do....	Do.
	15	.....do.....	.....do....	10	.....do.....	July 5	.....do....	Do.

Year.	Cultivation.			Average yield per acre in bushels.	Remarks.
	Intervals.	Number of times.	Implement used.		
1905	Every 10 days.	4	2-horse surface cultivators.	15	Cultivated 4 times with 2-horse surface cultivators.
1906	.....do....	4	.....do.....	37.5	Harrowed when corn was 3 inches high; was neither thinned nor hoed. Cultivated every 10 days.
1907	....do....	4	.....do.....	40	Same as above.
	....do....	3	.....do.....	25	Badly damaged by cutworms; also suffered from drought.
	....do....	2	.....do.....	40	Harrowed when 3 inches high, and as there was continued dry weather harrowed again when 6 inches high. Weather continued dry and yield attributed to second harrowing.

The corn land for 1907 was prepared, planted, and cultivated the same as for 1906 and followed one crop of cowpeas. The seed used was that saved from the 1906 crop. Fifteen acres were planted March 23 and yielded 40 bushels to the acre, 20 acres were planted May 15 and yielded 25 bushels to the acre, and 15 acres were planted July 5, yielding 40 bushels to the acre. The average for the year was 34 bushels to the acre, or 3½ bushels less than the average for 1906. This loss is doubtless due largely to the fact that the planting on May 15 was badly damaged by cutworms and also suffered greatly from drought, considerably reducing the general average for the season.

In this connection it may be stated that Mr. Walker has found it advisable to plant corn at different dates, so that in case of an unfavorable season all of the crop will not suffer. He also finds that early planting insures early feed, but requires more frequent cultivation (see Table V). However, the cultivation is practically over by the time hot weather sets in. (See Table VI.)

LEGUMINOUS CROPS.

COMPARISON OF THE OPERATIONS WITH COWPEAS FOR 1905, 1906, AND 1907.

It has already been shown that cowpeas have played the most important part in the improvement of the land of this farm. In a further study of the operations during these three years it is found that they have not only added very materially to the supply of fodder and grain for home consumption, but have also yielded a salable surplus that has proved a valuable source of revenue.

TABLE VI.—*A comparison of the operations with cowpeas in 1905 and 1906.*

Year.	Area in acres.	Preparation of land.	Seeding.				Product.
			Date.	Method.	Rate.	Implement used.	
1905	80	Plowed and harrowed.	May 1 to 7	In drills 6 inches apart.	1¼ bushels.	Grain drill.	Hay. Grain.
1906	120	Plowed, disked, and harrowed.	April 20 to July 20.	In drills 6 inches and 12 inches apart.	1 bushel and ½ bushel.	...do...	Hay. Grain.

Year.	Yield per acre.	Total yield.	Amount sold.	Price received.	Total amount received.
1905	1.5 tons 8 bushels	120 tons. 640 bushels	20 tons. 100 bushels	$15 per ton. $2 per bushel	$300 200
1906	0.966 ton 9.5 bushels	116 tons. 1,140 bushels	100 tons. 1,000 bushels	$15 per ton. $2.25 per bushel	1,500 2,250

In 1905, 80 acres were plowed in the early spring, harrowed, and planted to cowpeas the first week in May. The seeding was done with a grain drill, with all the tubes open, at the rate of 1¼ bushels to the acre. When about two-thirds of the pods had turned yellow the mower was started and the peas cut for hay. Each day's cutting was raked up the next morning, while there was still some dew on the vines, to prevent shelling, and stored in the barn the same afternoon, provided the weather was clear and hot. The hay goes through a sweating process after it has been put into the barn, and during this period becomes very hot and wet, but if left undisturbed it will come out all right, even if stored away partially green.

Owing to the high price of cowpea seed and the large quantity necessary for planting, Mr. Walker determined to save the necessary seed, if possible. For this purpose he bought a pea thrasher and a 12-horsepower gasoline engine to run it. He also found that the baler could be operated at the same time by a belt from the separator. In this way the peas could be thrashed and the shredded vines baled in the same operation. He now puts all the cowpea crop through this machine each year, and what hay and grain is not needed at home is sold.

During the leisure months of the autumn and winter, when there was little that could be done in the fields, the men were put to work to thrash the peas and bale the vines. (See fig. 5.)

In 1905 the cowpeas yielded at the rate of 1½ tons of hay and 8 bushels of seed per acre, of which a surplus of 20 tons of hay and 100 bushels of seed was sold, the hay bringing $15 a ton and the seed $2 a bushel.

In 1906, 160 acres were prepared for cowpeas by plowing deep, disking, and harrowing. The land was prepared in fields of 20 acres each, and as each field was ready for planting the drill was started, followed by the smoothing harrow. The first peas were planted on April 20 and at intervals until July 20.

In order to determine the proper quantity of seed to sow for the best results, 10 acres in each of the 20-acre fields were planted with

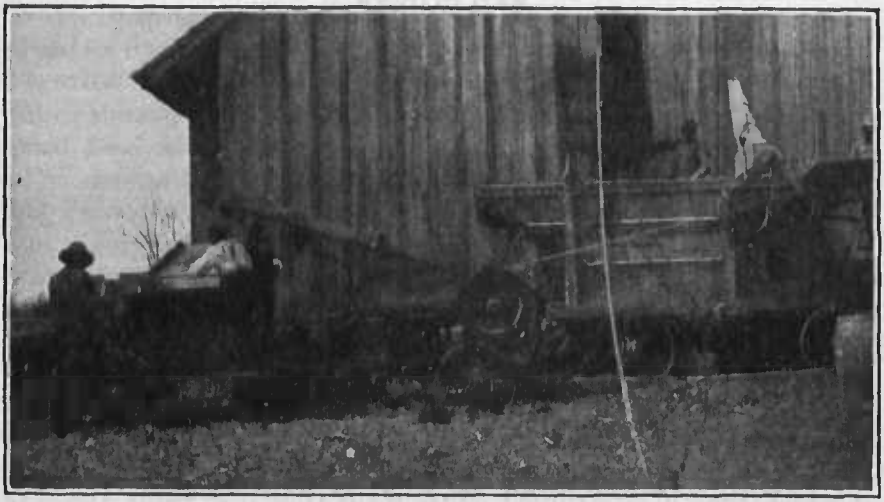

FIG. 5.—Pea thrasher and baler in operation. With this machine the cowpeas are thrashed and the vines shredded and baled in one operation.

all of the tubes of the drill open, and the other 10 acres with only each alternate tube open. In this way the drills were 6 inches and 1 foot apart, respectively. In the first instance it required 1 bushel of seed to the acre, and in the latter only half that quantity. The result was a greater yield of both hay and grain when the smaller quantity of seed was used. It was also found that the later plantings produced more seed than the earlier ones. Unfortunately, only 120 acres of this crop were saved, as the last 40 acres planted were destroyed by continuous wet weather. However, the remaining 120 acres yielded 116 tons of shredded hay and 1,140 bushels of clean seed. Of this crop 100 tons of hay at $15 a ton and 1,000 bushels of seed at $2.25 a bushel were sold—a total of $3,750 for the surplus cowpea crop alone.

Owing to the very dry season and the scarcity of labor, only 60 acres of cowpeas were planted in 1907. The land was plowed, disked, and harrowed in the usual way and the seed planted in drills 3 feet 6 inches apart. This was done with a corn planter having a drill attachment, at the rate of a peck of seed to the acre. The peas were harrowed with a light section harrow when 4 inches high, and again when about 8 inches high, and were cultivated once afterwards with a surface cultivator. This method of planting proved more satisfactory than any heretofore tried. No estimate has been made of the yields, as no more of the crop was raised than was needed for home use, and only enough grain was thrashed to furnish seed for the next year's planting. However, where a stand was obtained it is estimated that the peas yielded 15 bushels to the acre.

RED CLOVER.

In the early part of September, 1905, 2 acres from which a crop of cowpeas had just been harvested were double disked, harrowed thoroughly, and seeded to red clover at the rate of 15 pounds to the acre. This was done with a hand seeder, half of the seed being sown one way and the other half at right angles to the first. The field was then lightly harrowed. The stand obtained was very fine and withstood the winter well. On May 12, 1906, the clover had attained a height of about 46 inches and when cut for hay yielded 3 tons to the acre. The second crop was allowed to ripen and was then disked in and harrowed. It was noticed that very few nodules were present on the roots of this crop.

The seed disked in in this way came up with the first rains in the fall, made a good stand, and came through the winter well. By April 1, 1906, the clover had attained a height of about 15 inches, at which time it was turned under for cotton (see Table IV). It was now noticed that the roots were abundantly supplied with nodules.

WINTER CROPS.

Crimson clover, bur clover, and vetches have all been grown in a small way during the past two years, and in each case the results were very satisfactory. Bur clover, however, seems to adjust itself to the new conditions better than the others. Yet crimson clover yielded last year at the rate of more than 3 tons of hay to the acre.

In introducing these winter crops it was decided to select a well-drained area and to plant the same plot each year until the soil should become thoroughly inoculated. As was expected, in some cases rather indifferent results were obtained the first year, but in each case the land was replanted the next autumn, and now not only the

original plots are becoming inoculated, but the bacteria are spreading out in all directions. At this writing about 60 acres of winter crops have been planted, in which the crops above mentioned, either singly or in combination with others, form the principal part.

Another point worthy of special mention that has become very prominent in this connection is that winter crops in this latitude must be planted early enough in the fall to get a good root system developed before frost comes on; otherwise the crop will not make much growth before spring and is much more likely to be winter-killed. With a well-developed root system winter crops will perform the proper functions for which they are intended in the South; that is, they will make considerable growth during favorable periods in winter and will afford pasturage for stock at times when the ground is not too soft; they will bind the soil and prevent washing; when allowed to grow in the spring they will make sufficient growth to be plowed under as a green manure or make an early crop of hay, whichever is most desirable.

Mr. Walker says:

> Without a doubt the best method to seed clovers and fall grains is to double disk and harrow pea stubble as soon as the pea crop is off the ground. In nearly every case it will be found that this ground will contain a good supply of moisture. Sow clovers broadcast and follow with a board drag to cover seed.

ALFALFA.

Along with the establishment of suitable hay crops, alfalfa was tried in a small way. The first planting was made in 1905 on a well-drained piece of land. Although the seed was carefully inoculated, only about half a stand was obtained. The next year a larger area was put into good condition and planted. This included the area planted in 1905. The results on the new part were the same as in the previous year, while a good stand was obtained on the old portion, yielding three cuttings, the first two cuttings averaging a ton of hay each, and the last half a ton to the acre.

In 1907, four acres adjoining the original plot were carefully prepared for planting and the soil inoculated both by scattering soil from the older tract and by scattering one cutting of the hay from this plot and working it into the soil. The stand in November was very unsatisfactory, despite the fact that every precaution had been taken to insure inoculation, and in order to determine the true cause for this failure a sample of the seed was sent to the Department of Agriculture for test. At the end of a five days' test only 38.4 per cent of the seed germinated. This seed was bought of a reliable firm, yet it was very poor and there is little doubt that this was the principal cause of failure in this case.

CAUSES OF FAILURE IN GROWING LEGUMES.

The main causes of failure in securing a proper stand of leguminous crops in the South are (1) poor soil, (2) absence of proper nitrogen-fixing bacteria, and (3) poor seed.

POOR SOIL.

Many of the lands that have been growing cotton and corn under the tenant system for years have lost a great deal of their former productiveness. We often hear the term "worn-out soils" applied to them. They are worn out only in the sense that the humus (decaying vegetable matter) in them has been used up by constant clean cultivation, such as cotton and corn usually receive. Without humus any soil is robbed of most of its ability to hold available plant food for crops.

We are accustomed to hear the legumes spoken of as having the power, through the nitrogen-fixing bacteria in the nodules on their roots, to draw much of their nourishment from the air. There is, however, a period in the growth of these young plants when plenty of available nutriment must be present in the soil. This period begins when the seedlings have exhausted the stored-up food in the seed. It ends when enough bacteria have developed to furnish the needed supply of nitrogen from the air. Consequently, if the seed has been sown in soil that has been robbed of its humus there is not enough available food for the plant and it dies. Fortunately, there are some strong, vigorous-growing legumes that are better adapted to poor soils than others, and by growing them first the way can be prepared for the more delicate varieties.

The cowpea is a good example of this kind of crop, yet even it frequently gives poor returns on worn-out soils. It will be noticed that on this farm the yield of cowpea seed has steadily increased each year. This is no doubt due largely to the improved methods of seeding adopted, but is it not reasonable to think that part, at least, is due to the improved condition of the soil, a fact evidenced by the increased yields of cotton and corn? In other words, if the cowpea will grow on a poor soil, will it not grow better on a better soil?

Then, too, weeds and trash plowed under and allowed to rot help greatly. Barnyard manure, if available, is always to be relied upon. Deep plowing and the turning under of vegetation add humus and prevent the soil from "packing" after hard rains, a fault very common with the old lands of the South.

ABSENCE OF NITROGEN-FIXING BACTERIA.

Poor soils are usually lacking in bacteria suitable to legumes, for two reasons. The lack of humus in the soil makes it impossible for these bacteria to find a home in which to obtain food and shelter through

the winter, as they live in the tissues of the decaying leaves, stems, and roots in the soil, and if these are not present they perish. Then, again, on land that has never before grown any of these crops the proper bacteria may never have been present in the soil. Consequently, legumes can not be expected to do their best until bacteria have been supplied in sufficient quantities for the needs of the plants. In the case of the cowpea, on the other hand, we have a crop that has been grown very generally all over the cotton belt for a great many years, and the soils of this region seem to be well supplied with the cowpea bacteria, which no doubt accounts for the ability of this plant to thrive on soils where crops that had never been grown before would fail.

After many years of experimentation it has been demonstrated that it is only a matter of time and patient effort to grow crimson clover, bur clover, the vetches, etc., successfully. The great trouble heretofore has been that farmers who have tried to grow these crops gave up at the end of the first trial, instead of keeping at it for a year or two longer so as to give the proper bacteria a chance to develop. Special attention is called to Mr. Walker's experience in this direction. In the first crop of red clover sown by him very few nodules developed on the roots, but in the second crop they were abundant. The same was true with the other crops, including alfalfa. It is confidently expected that in a very few years, if Mr. Walker continues his present methods, his farm will be so well supplied with the bacteria necessary that all of these crops will be grown with the same certainty of success as cowpeas.

POOR SEED.

The quantity of poor seed on the market at the present time is appalling, and hundreds of failures to procure a stand are directly attributable to inferior seed. In order to prevent the great loss of time and money which results from planting unreliable seed, it is necessary to test all seed bought, or, preferably, it should be tested before it is bought. The seedsman's assurance that it has been tested should not be accepted. Seed should be carefully examined and before purchasing it a sample should be sent to the State agricultural experiment station or to the United States Department of Agriculture for test.

Such tests cost nothing except a few cents for postage. If desired, however, seed can be tested at home by the following simple method:

Method for Testing Seeds at Home.

Count out 100 seeds on a wet blotter or piece of wet flannel and cover them with another piece of the same material; place in a plate or shallow pan and cover with a pane of glass or an inverted plate;

then set on a shelf in the kitchen. At the end of four to six days examine the seeds and count the number that have germinated. This number will be the percentage of germinable seeds.

When seed testing is adopted generally by the farmers of this country, dealers will be compelled to offer only first-class seed for sale.

SURFACE DRAINAGE.

It was stated at the beginning that the farm described in this bulletin was poorly drained. As tiling or any other form of underdrainage was too expensive to be considered, it was necessary to use some form of surface drainage. Fortunately a creek crosses one portion of the farm and affords an outlet for water from the whole farm, although the fall is very gradual and water runs off slowly after heavy rains.

The following drainage method has been adopted and is proving very satisfactory: During the winter months or after a heavy rain,

FIG. 6.—Drag, or grader, used in smoothing the sides of a ditch in establishing surface drainage. It is also used, as may be seen in the illustration, in grading up the roads on the farm. In this connection it will be interesting to note that at the point where the photograph was taken the road was in exceedingly bad shape until this grading was done. During the winter following it was in as good shape during the entire season as when the photograph was made.

while the water is still standing on the ground, stakes are set in the lowest places on the farm. When the water is gone and the land dry, a plow furrow is run along the line of stakes leading to the creek. Two furrows are thrown out each way, leaving a deep "dead" furrow. Next, a drag, or grader, is used (fig. 6) to throw the loose soil farther back and leave a gradually sloping bank, so that water can drain into the furrow readily at all points along its course.

This sloping bank also allows machinery of all kinds to pass over the furrow anywhere with very little jar. Great care must be taken that all obstructions and banks of earth are removed, so as not to stop the water in any way. (See fig. 7.)

To prevent washing, as soon as the furrow is made and the sides smoothed down as described, rye should be sown at once all over the newly opened soil, and with it a mixture of redtop, white clover, and Japan clover. The rye will come up first and hold the soil in place until the more permanent grasses have taken root. By keeping the sides cut for hay each year, briers and brush will be kept down,

FIG. 7.—A newly opened surface drain with the sides not yet sufficiently smoothed down.

which will aid greatly in preventing obstructions from accumulating. Unless the sides and bottom of the ditch are seeded very quickly, serious washing is likely to occur.

LABOR AND TOOLS.

A noteworthy feature of the work of this farm is the use that has been made of labor-saving machinery and tools. The check-row planter and 2-horse cultivators have done away with the use of the hoe in the cultivation of cotton and corn. The pea thrasher has made it possible to utilize the cowpea with far greater profit than could ever be done by the old method of hand picking. The breaking is done with a 16-inch sulky plow, requiring 3 horses and cutting 3 acres a day, and a gang plow requiring 4 horses and cutting 5 acres a day. The disking is done with an 8-foot disk harrow and during the past season, on account of the scarcity of labor, a 2-section smoothing harrow was hitched behind the disk, requiring 6 horses to pull them. With this arrangement one man can disk and harrow 16 to 20 acres a day. In harrowing corn and pea land a 4-section harrow is used, requiring 4 horses, with which one man can harrow 35 to 40 acres a day. By using a drill attachment with a corn planter a fast-walking team will plant 20 acres of cowpeas a day.

LIVE STOCK.

MULES.

The principal object of this farm is to raise mules for the market. For this purpose Mr. Walker has stocked it with brood mares, some native to that section and others from the North. These latter are mostly standard bred, and according to Mr. Walker produce mules neater in build, cleaner of limb, and more active than those from native mares. (See figs. 8 and 9.)

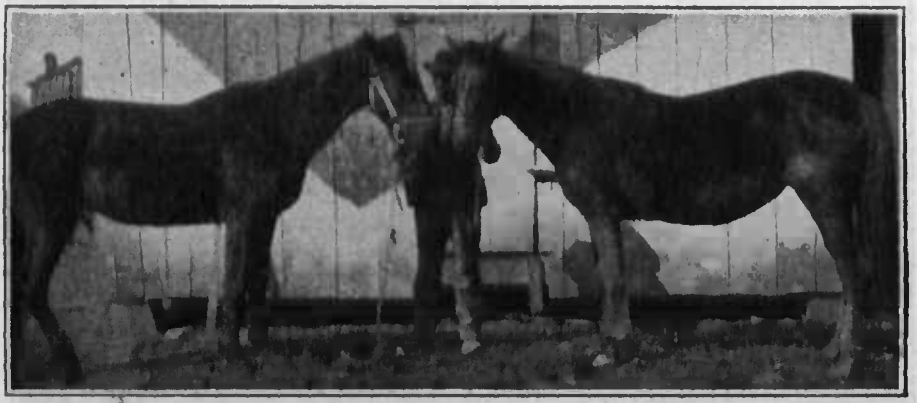

FIG. 8.—A native-bred mare (left) and one of a standard breed (right).

Mr. Walker finds that young northern mares become acclimated readily when brought south in the early winter. Old mares, however, especially drafters, do not do well.

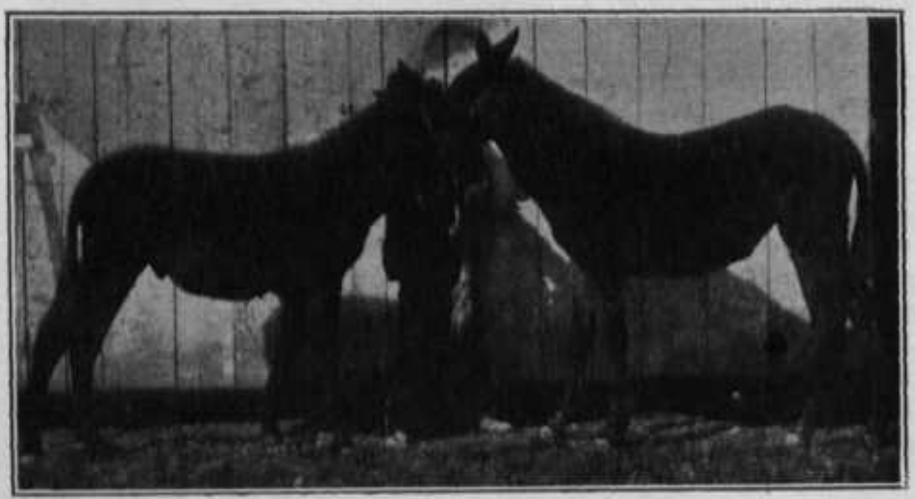

FIG. 9.—Mule colts of the mares shown in figure 8, standing in the same relative positions as their mothers.

Only recently the first returns from these mares were received when four 2-year-old mules and two yearlings sold for $650, or an average of $108.33 each.

HOGS.

Incidentally, hogs have been a considerable source of profit during the past two years in using up the waste grain in the corn and cowpea fields and around the pea thrasher. These, together with the cotton, cowpeas, and hay that were sold, have been the principal sources of revenue during this period of restoration.

SUMMARY.

In 1905 the farm described in this bulletin produced one-fourth of a bale of cotton and 15 bushels of corn to the acre.

In 1906, after a crop of cowpeas, it produced one-half of a bale of cotton and 37½ bushels of corn to the acre.

In 1907, after a crop of cowpeas, it produced one-half bale of cotton and 34 bushels of corn to the acre; after cowpeas and 300 pounds of commercial fertilizer, nearly three-fourths of a bale of cotton to the acre; and after cowpeas and clover continuously for two years, one bale of cotton to the acre.

Deep plowing had no detrimental effect on the yields.

Planting corn at different dates tends to safeguard the crop generally against unfavorable seasons and insect pests.

The early planting of corn insures early feed but requires more frequent cultivation.

The late planting of corn produces good seed and winter forage.

Planting cotton and corn in check rows and cultivating both ways saves both seed and labor and on level land does away with chopping and hoeing.

Red clover has proved successful in this latitude as a soil builder and as a hay and seed crop.

Cowpeas have been the most important factor in building up the fertility of the soil.

The pea thrasher has made it possible to utilize the cowpea not only for feed and seed but also as a source of considerable revenue.

Planting cowpeas in rows 3 feet 4 inches apart saves seed and brings greater returns in yields of seed and hay.

Crimson clover, bur clover, and the vetches are successful as winter cover crops when inoculation has been thoroughly established.

Early planting in the autumn is absolutely necessary for the best results with winter crops.

It requires two to three years to thoroughly inoculate worn-out soils with such legumes as have never before been grown on them. The ground should be planted again to the same crop, and a third time, if necessary. Success will follow.

Poor soil, lack of the proper bacteria, and poor seed, either separately or collectively, are responsible for almost every failure of legumes.

Shallow surface drains, with the sides and bottom well sodded, insure against water standing on the fields.

Labor-saving tools make possible thorough cultivation with the least labor.

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